in a parenthesis of the epoch-making work of Schäfer and Oliver, there is nothing to indicate that it was these workers who founded our knowledge of the physiology of this organ. Adrenaline is referred to as a chemical substance of known composition, but there is no description of its constitution, nor of the success which has attended the efforts which have been made to synthesise it.

The account given of the pituitary is similarly marred by the entire omission of Herring's and Howell's researches, which have thrown so much light on its development, structure, and functions.

Nussbaum's work on the kidney is mentioned and dismissed with a shrug because Adami failed to confirm some of his statements. We are not told that Adami subsequently withdrew most of his criticisms, nor of the important recent development of the Nussbaum method in this country, which has shown that this particular means of investigation has proved to be a sheet-anchor in our conception of the mechanism of the renal organs.

So also in the discussion on the absorption of proteins the author's knowledge seems to have stopped short at an epoch when it was believed that proteose and peptones were absorbed as such, and we have many pages devoted to an antiquated description of how these are re-synthesised in the intestinal wall into the blood-proteins. The work of Fischer, Abderhalden, and a host of American workers is passed by without a reference.

Such examples might be multiplied almost to weariness. It would therefore be advisable that if advanced students take this book as their guide it would be well for them not to rely exclusively upon it. They will derive both pleasure and profit from its study, but if they desire the latest and most accurate account of modern views they should supplement it with reading other books which deal rather with the present than with the past.

(2) Dr. Piéron's book on sleep is of quite a different character, for it only treats of one small corner of physiology, and yet he has contrived to write a volume on this subject almost equal in length to the one we have just considered. It, however, resembles Prof. Luciani's in its wealth of references. Some sixty pages are devoted to bibliography alone. This indicates how much has been written, but it also shows how little we really know. If physiologists had satisfactorily solved the intimate meaning of sleep, there would be no need of so much discussion and printer's ink, and the subject might have been discussed in as many lines as there are pages devoted to it. It is only fair to say, however, that the book is a singularly interesting one, and the subject is discussed with that admirable clearness which distinguishes the writings of most French authors. Of all the numerous theories advanced, some chemical, some circulatory, some histological, some psychological, and so forth, the author most inclines to the so-called inhibition hypothesis. The book is entitled a physiological problem, but many pathological or quasi-pathological states are included; thus we have chapters devoted to coma, unconsciousness produced by drugs and other means, fatigue, hypnosis, and others. It will therefore appeal to the students of pathology and medicine as well as to those who make physiology their life-work.

(3) The third book on our list, that by Dr. Plimmer on protein synthesis, is the second edition of a work which has already been favourably noticed in these columns. The mere necessity of a second edition of such a highly technical work is no mean testimony to its excellence. So rapid have been the recent advances in knowledge on this question that the book is very largely a new one, and it is thoroughly up to date. To peruse the original memoirs on which the book is founded is a task which would deter many authors, and certainly the majority of readers. The useful summary Dr. Plimmer has given will relieve the latter class from undertaking such a labour. It would be damning the book with faint praise to say that it is interesting; it is far too technical and packed with facts and formulæ to make it light reading, but to those who want to know the recent developments in one of the most important of the problems of the day to which either chemists or biologists can apply themselves, the book will prove a veritable godsend. W. D. H.

THE GAS TURBINE AND OTHER ENGINES.

(1) *The Gas Turbine.* By H. Holzwarth. Translated by A. P. Chalkley. Pp. viii + 140. (London: C. Griffin and Co., Ltd., 1912.) Price 7*s.* 6*d.* net.

(2) *A Primer of the Internal Combustion Engine.* By H. E. Wimperis. Pp. xiii + 143. (London: Constable and Co., Ltd., 1912.) Price 2*s.* 6*d.* net.

(3) *Vapours for Heat Engines.* Including Considerations Relating to the Use of Fluids other than Steam for Power Generation. By Prof. W. D. Ennis. Pp. v + 78. (London: Constable and Co., Ltd., 1912.) Price 6*s.* net.

(1) ENGINEERS interested in this very difficult problem are much indebted to Mr. Holzwarth for his ingenuity, to Mr. Junghaus for his support, and to both for their liberality

in making public the results of their labours in this direction up to the present. Though the book is but a small volume of 140 pages, the matter is greatly condensed, and will demand close attention for its full significance to be appreciated.

The essential unit of the Holzwarth gas turbine consists of a combustion chamber into which gas, or hydrocarbon vapour, and air are delivered at a small pressure by a suitable pump through mechanically operated inlet valves; ignition is by high-tension magneto, and the resulting high temperature and pressure combustion products then discharge through a spring-controlled flap valve, *via* a nozzle, to the rotor vanes; having passed the rotor, the gases enter an exhaust pipe, wherein a partial vacuum is constantly maintained by an exhauster. Very shortly after ignition the flap valve is slowly closed by mechanical means, time being permitted for a gust of scavenging air to pass through, thus cleansing and filling the combustion chamber in readiness for the next working charge of vapour, and cooling the nozzle and rotor vanes. The action is thus intermittent, and the design involves three valves in each unit, together with charging and exhausting pumps. In the actual turbine several such units are arranged symmetrically around a turbine wheel or rotor, the continuous speed of which is preserved by the successive impulses thereby imparted to its vanes. As fuels, petrol, kerosene, gas oils, benzol, and even tar oil may be satisfactorily employed.

The book is divided into four sections, in the first of which a theory of the gas turbine is exhibited mathematically by aid of analysis and of entropy diagrams; much of this part is of the nature of a summary of formulæ and results, and cannot be fully appreciated without much reference to other works; moreover, partly on account of difficulties of analysis, but largely from imperfection of the physical data, some of the conclusions reached are of a very conjectural character, and may require substantial qualification after a more extended practical experience. The author considers in detail the several operations of charging, compression, ignition, combustion, expansion, and scavenging; he concludes that the intermittent action used, with the lowest possible temperature of charge prior to ignition, and the largest possible nozzle opening, is essential to economy, and is conveniently realisable in actual design. Data relative to compression are still wanting, and the investigation given proceeds largely upon assumptions suggested by experience and general knowledge; in the Holzwarth combustion unit it is not practicable to compress to any extent before ignition, but the author is persuaded that satisfactory turbine efficiencies are attainable at much lower compressions than are usual in reciprocating engines.

An interesting section of the work is that dealing with the utilisation of the exhaust heat; by aid of a "regenerator," sufficient heat is said to be recoverable to work the charging and exhausting apparatus.

The construction and details of the actual turbine are described, and the text is illustrated by many well-drawn and clearly executed figures. The gas turbine is as yet in its infancy, and it would be unfair at the present time to compare it with the modern reciprocating high-efficiency engine; in the last section of the book test results are given, together with copious diagrams and tables. Progress is continuing, and further experimentation is needed, and will be carried out by the able author and his business colleague.

The translator is to be congratulated on his work; the text is in such good and clear English as to betray no suggestion of its German origin. The book is well printed and illustrated, and from all points of view is a welcome and valuable addition to the literature of the problem.

(2) This is an excellent elementary text-book on the internal combustion engine, with special reference to the small petrol engine, and forms a suitable introduction to the larger work by the author on the same subject; though succinctly presented, the matter is never obscure. A brief historical notice is succeeded by an account of the leading facts of the theory of heat and the fundamental formulæ of the ordinary theory of perfect gases. The desirable feature appears of a limited use of easy differentials, the several steps of the reasoning being given in full so that the student should experience no difficulty in following the argument to its conclusion; that nebulous quality, entropy, is also dealt with intelligibly, and a useful account is given of indicators and indicator diagrams. The difficult subject of explosion pressures is treated in the light of the results obtained by the Gaseous Explosions Committee, the variability of specific heat with temperature being suitably emphasised. This is followed by descriptions and large sectional views of actual typical engines, including the Diesel and semi-Diesel types, together with illustrations and an account of uncooled and cooled pistons and valves, and a short note on Aëro engines.

Chapter vi. treats more fully of fuels, both liquid and gaseous, including alcohol and benzol, and the principle of the gas producer; next some engine details, notably ignition and carburation, are shortly described; finally, a chapter is devoted to the testing of engines, and reference is made to the author's accelerometer; we should like to have found a more detailed account of this very ingenious and useful instrument. Examples are introduced in various portions of the work for the student's exercise on points of theory, and answers to many of these are given at the end of the work, which concludes with a useful index. Both in matter and style the book is much better than many of the small elementary treatises that have already appeared, while the printing and illustrations leave nothing to be desired. Altogether this forms an attractive and useful little work which will prove of real assistance to the student in the earlier portions of his course.

(3) In this tract of 78 pages are conveniently collected data as to the physical properties of special interest to the engineer of several liquid substances, including alcohol, chloroform, carbon tetrachloride, ether, ammonia, sulphur dioxide, acetone, and carbon disulphide, together with steam tables. The collection should prove useful for purposes of reference; the author uses British thermal units and Fahrenheit degrees of temperature, and his figures will thus be immediately available to the great majority of British engineers to whom it is still difficult to think in metric and centigrade units, notwithstanding the theoretical advantages claimed for the metric system.

In appendix i. the formula for chloroform ($CHCl_3$) is incorrectly given as C_2HO_3, and "carbon chloride" is used for carbon *tetra*-chloride; as there are several carbon chlorides it seems desirable to distinguish clearly which is referred to.

The work is well got up, and contains numerous tables and diagrams relative to the substances dealt with, together with a discussion of the limits of efficiency attainable theoretically with the several liquid fuels considered.

OUR BOOKSHELF.

Percentage Compass for Navigators, Surveyors, and Travellers. By J. C. Fergusson. (London: Longmans, Green and Co., n.d.) Price, unmounted, 2*s*. 6*d*. net; mounted on linen, 3*s*. 6*d*. net.

MR. FERGUSSON has apparently just discovered what everyone knew before, viz., that at the angle of 45° the natural sine is equal to the natural cosine, or the one is 100 per cent. of the other, and, being obsessed with the idea that the one great object in life is to work out percentages, he has taken the trouble to find the values of the natural cosines when the natural sine has any percentage from 1 to 100 to those natural cosines. He then divides the compass circle into octants, and each octant into 100 unequal parts, or percentages, and states that by the use of these percentages Traverse tables are no longer required.

What Mr. Fergusson has really done is to make a new Traverse table where the natural cosine, arranged in percentages in a circle outside the compass, has to be multiplied by the percentage course steered to obtain the natural sine.

At present both natural cosine (diff. of latitude) and natural sine (departure) can be obtained from the ordinary Traverse tables for every degree of the compass and for any radius between 1 and 300.

Not only does Mr. Fergusson give a roundabout way of obtaining a result which can be readily extracted from the Traverse tables, but he also seems to think that the natural cosines and sines on a circle, the zero of which points to the magnetic north, will give the difference of latitude and departure by utilising the percentages of the octants on a compass card marked by his method. These, it is scarcely necessary to point out, can only be ascertained when the zero of the circle points to the true north, or each course steered has been corrected for the magnetic variation and any local disturbance caused by a vessel's magnetism.

An Essay on Hasheesh. Including Observations and Experiments. By Victor Robinson. Pp. 83. (New York: "Medical Review of Reviews," 1912.) Price 50 cents.

IT is difficult to regard this booklet as a serious contribution to medical literature. It consists of about four score small, narrow pages, about half of which are occupied by an account of the hallucinations and rhapsodies experienced by the author when under the influence of the drug *Cannabis sativa*. What the precise value of these observations is it is impossible to discover. It is no more practicable to subject them to rational or systematic analysis than to attempt to find reason or method in the incoherent ravings of delirium. The particular manifestations induced by Indian hemp must, of course, largely depend upon idiosyncrasy, temperament, antecedent and accidental conditions, and a host of predetermining and fortuitous causes, and must therefore vary from individual to individual and differ, too, in different circumstances even in the same individual.

The only valuable section of the book is the short digest of the little that is known from prior work concerning the therapeutics and chemistry of hasheesh.

Life and Evolution. By F. W. Headley. Pp. xx+272. Second edition. (London: Duckworth and Co., 1913.) Price 5*s*. net.

THE present does not differ greatly from the first edition, which was reviewed in the issue of NATURE for March 7, 1907 (vol. lxxv., p. 434). Mr. Headley has re-written a few pages, corrected occasional inaccuracies, and replaced several unsatisfactory illustrations by better. He has also, in the light of new facts which have become available since the book appeared first, modified some of his views.